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Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

(First Revision)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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August 1981

IS : 2542 (Part II/Sec 1 to 8) - 1981

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

(First Revision)

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AMENDMENT NO. 1 APRIL 1991

TO

IS 2542 (Part 2/Sec 4) : 1981 METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART 2 GYPSUM PRODUCTS

Section 4 Transverse Strength

(First Revision)

(*Page* 16, *clause* 3.3.2, *lines* 9 *and* 12) — Substitute '1 000 N/m^2' *for* '100 kg/m^2'.

(CED 21)

Printed at New India Printing Press, Khurja, India

AMENDMENT NO. 1 APRIL 1991

TO

IS 2542 (Part 2/Sec 6) : 1981 METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART 2 GYPSUM PRODUCTS

Section 6 Water Absorption

(First Revision)

(*Page* 19, *clause* **3.1.2.1**, *last sentence*) — Substitute the following for the existing sentence:

'The specimens shall then be placed in an air-oven capable of being raised to 45 ± 2°C and then maintained at the temperature for 24 hours.'

(*Page* 20, *clause* **3.1.2.2**, *first sentence*) — Substitute the following for the existing sentence:

'The specimens shall then be allowed to cool in a desiccator having blue silica gel and weighed and the constant mass W_2 (within 0·1 percent of the mass of the specimens) shall be recorded for each specimen.'

(CED 21)

Printed at New India Printing Press, Khurja, India

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 30 June 1981, after the draft finalized by the Gypsum Building Materials Sectional Committee, had been approved by the Civil Engineering Division Council.

0.2 A number of Indian Standards on building gypsum covering specifications, methods of test and codes of practice are being prepared with a view to assisting the industry, which is in the initial stages of development. This standard, which is one in the series, covers the methods of test for evaluating the different physical properties of gypsum building materials. For the convenience of the users, this standard covering test methods on gypsum building materials has been prepared in two parts as follows:

Part I Plaster and Concrete, and
Part II Gypsum Products.

In the specifications for gypsum plaster and gypsum products, reference has been made to the particular standard on method of test while laying down the physical requirements to be satisfied by the material.

0.3 This part (Part II) was first published in 1964. The revision was taken up with a view to updating the methods of test in line with the current knowledge on the subject. Apart from revising the methods of test already covered in the first version of this standard, the revision incorporates methods of test for fibrous gypsum plaster boards covered by IS : 8273-1976*. Further, the method of test for determining the non-combustibility of gypsum partition blocks has been deleted since the Sectional Committee decided that the corresponding test method given in IS : 3808-1979† was suitable for determining the non-combustibility of gypsum partition blocks.

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*Specification for fibrous gypsum plaster boards.

†Method of test for non-combustibility of building materials (*first revision*).

0.3.1 For the sake of facility in referring to the methods of test, it has been considered more rational to treat each method of test a section and accordingly the revision consists of eight sections.

0.4 Apart from the methods of test for properties specified in IS : 2095-1964*, IS : 2849-1964† and IS : 8273-1976‡ for gypsum plaster boards, gypsum partition blocks and fibrous gypsum plaster boards, respectively, this standard covers a few more tests recommended for these three products and precast reinforced gypsum slabs.

0.5 In the formulation of this standard, due weightage has been given to international coordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in the country.

0.6 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960§.

---

*Specification for gypsum plaster boards.

†Specification for non-load bearing gypsum partition blocks (solid and hollow types).

‡Specification for fibrous gypsum plaster boards.

§Rules for rounding off numerical values (*revised*).

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

Section 1 Measurement of Dimensions

(First Revision)

1. SCOPE

1.1 This standard (Part II/Section 1) covers the method of measuring the dimensions of gypsum products.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2469-1976* shall apply.

3. PROCEDURE

3.1 Plaster Board

3.1.1 *Length and Width* — Measurements of length and width shall be carried out on each of the full-size boards of the sample. The measurements for length and width shall be made separately by calipers, rule or other suitable means at three points on each board.

3.1.2 *Thickness* — Measurements of thickness shall be carried out on the full-size boards of the sample. The thickness shall be measured to an accuracy of ± 0·025 mm. The contacting surface of the micrometer shall have a diameter of not less than 6 mm and care shall be taken that the sample is not deformed when the thickness is measured. The readings shall be taken at six points at each end approximately equally spaced across the full width of the board. No readings shall be taken less than 25 mm from a cut and less than 75 mm from a folded edge.

3.1.3 *Report*

3.1.3.1 The average of the three measurements of length and width of each board shall be reported.

---

*Glossary of terms relating to gypsum (*first revision*).

3.1.3.2 The average of the twelve measurements of thickness for each board shall be reported.

3.2 Fibrous Plaster Board

3.2.1 *Length and Width* — The length and width shall be measured and reported as in **3.1.1** and **3.1.3.1** respectively.

3.2.2 *Thickness* — A saw cut shall be made partly along the length of the board and thickness measured at a number of points by suitable means. The actual thickness at any point shall be calculated by taking the average of the thickness measured at the point and at a distance of 35 mm along the saw cut on each side of the point.

3.3 Partition Blocks

3.3.1 Overall dimensions shall be measured between opposite faces of the block, the greatest measurement observed being taken as the dimension.

3.3.2 Sectional dimensions of hollow blocks shall be taken 25 mm from the ends of the block, the least measurement observed being taken as the dimension.

3.3.3 Shell dimensions shall be measured from the surface of the hollow space to the normal surfaces of the block inside the scoring.

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

Section 2 Determination of Mass

(First Revision)

1. SCOPE

1.1 This standard (Part II/Section 2) covers the method of determining the mass of gypsum products.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2469-1976* shall apply.

3. PROCEDURE

3.1 Plaster Boards

3.1.1 The determination of mass shall be carried out on full-size specimens in case of partition blocks and specimens taken for the transverse strength test in case of other products (*see* Section 4).

3.1.2 The recorded mass in grams of each specimen shall be the mass determined by conditioning the specimens to constant mass in accordance with **3.1.3**.

3.1.3 The specimens shall be conditioned by drying in an oven at a temperature of 35 to 40°C, to constant mass. The weighings shall be accurate to ± 0·1 percent of the mass of the specimen.

3.1.4 *Report* — The average of the weighings shall be taken and the mass in kg/m^2 shall then be determined and reported.

---

*Glossary of terms relating to gypsum (*first revision*).

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

Section 3 Determination of Mass and Thickness of Paper Surfacing

(First Revision)

1. SCOPE

1.1 This standard (Part II/Section 3) covers the method of determining the mass and thickness of paper surfacing of gypsum boards.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2469-1976* shall apply.

3. PROCEDURE

3.1 Preparation of Test Specimens — Cut approximately 175 mm square of the board from the field of each of the sample boards. Place the boards on an edge in an oven maintained at 120 to 150°C for not less than 4 hours and as much longer as may be required for the gypsum core to be softened by calcination. Then separate the face and back papers from the core by careful slitting, sawing and/or peeling. Avoid tearing, splitting or gouging of the paper. Remove adhering core material by brushing with a medium stiff brush. If desired, removal of core material can be facilitated by washing in a stream of water while brushing. Continue cleaning until paper is essentially free from adhering gypsum. If specimens have been washed, dry them to constant mass at 40 to 45°C. Whether washed or not washed, accurately trim them to 150 mm square. Then bring the specimens to normal mass by exposing them overnight to conditions of 27 ± 2°C and 65 ± 2 percent relative humidity.

---

*Glossary of terms relating to gypsum (*first revision*).

3.2 Determination of Mass and Thickness

3.2.1 *Mass* — Weigh the specimens of face paper together to the nearest 0·1 g and express the mass in g/m^2. Similarly determine the mass of the back paper.

3.2.2 *Thickness* — Using a micrometer gauge, measure and record the thickness of each specimen at three locations at least 100 mm apart. Average all the readings on the face paper specimens to obtain the thickness of the face paper. Average all the readings on the back paper specimens to obtain the thickness of the back paper.

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

Section 4 Transverse Strength

(First Revision)

1. SCOPE

1.1 This standard (Part II/Section 4) covers the method of carrying out transverse strength on gypsum products.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2469-1976* shall apply.

3. PROCEDURE

3.1 Plaster Boards

3.1.1 *Test Specimens* — Two specimens each 400 × 300 mm shall be cut from each board in the sample, one having the 400 mm dimension parallel to the fibre of the surfacing material and the other at right angles thereto. The specimen shall be weighed to within 1 g and then stored at a temperature of 27 ± 2°C in an atmosphere having a relative humidity of 65 ± 2 percent. The specimens shall be weighed once a day until the mass has become constant to within 0·1 percent.

3.1.2 *Testing*

3.1.2.1 The test specimen shall be placed centrally on self-aligning bearers *A*, *B* and *C* as shown in Fig. 1 The bearers shall be of mild steel 40 mm in diameter and shall be in the same horizontal plane and parallel to each other.

3.1.2.2 The distance between the bearers *A* and *B* at the lines of contact with the specimen shall be 350 mm. Bearer *C* shall be midway between bearers *A* and *B* measured horizontally and rest upon the surface of the specimen.

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*Glossary of terms relating to gypsum (*first revision*).

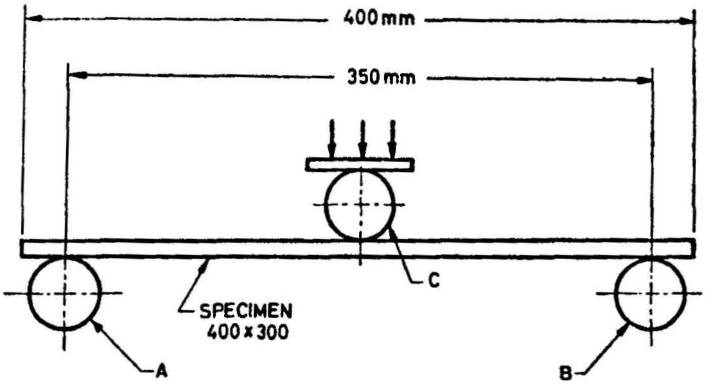

Fig. 1 Arrangement of Loading

3.1.2.3 The load shall be applied at a uniform rate through bearer *C*. The rate of loading shall not exceed 300 N/min and shall not be less than 175 N/min.

3.1.3 *Report* — The average breaking load of the specimens cut from the board in each direction shall be calculated; and the results of the transverse strength tests shall be reported for the load applied across the fibre and the load applied parallel to the fibre of the surfacing.

3.2 Fibrous Plaster Boards

3.2.1 *Test Specimen* — The test specimen 30 cm square shall be prepared with edges sawn true to line, and not chipped or damaged.

3.2.2 *Testing*

3.2.2.1 The test specimen shall be centrally placed with finished surface upwards, on two parallel supports 250 mm apart and extending across the full width of the specimen as shown in Fig. 2. The bearing edges of the support shall be rounded to a radius of 3 mm and shall be straight and in the same horizontal plane.

3.2.2.2 The load shall be applied to the specimen along a line parallel to and midway between the support at a rate of 50 N/min, by means of a steel roller 12 mm in diameter extending across the full width of the specimen and supported so that the load is evenly distributed across the specimen (*see* Fig. 2). The load measuring device shall be accurate to within one percent. The deflection of the specimen shall be measured to the nearest 1 mm.

3.2.2.3 The specimens shall be loaded up to the appropriate proof load to check whether the deflection under the proof load is less than the specified value. However, if the deflection under proof load is less than 6 mm, the load shall be increased until failure occurs. The specimen shall then deflect not less than 6 mm before failure occurs.

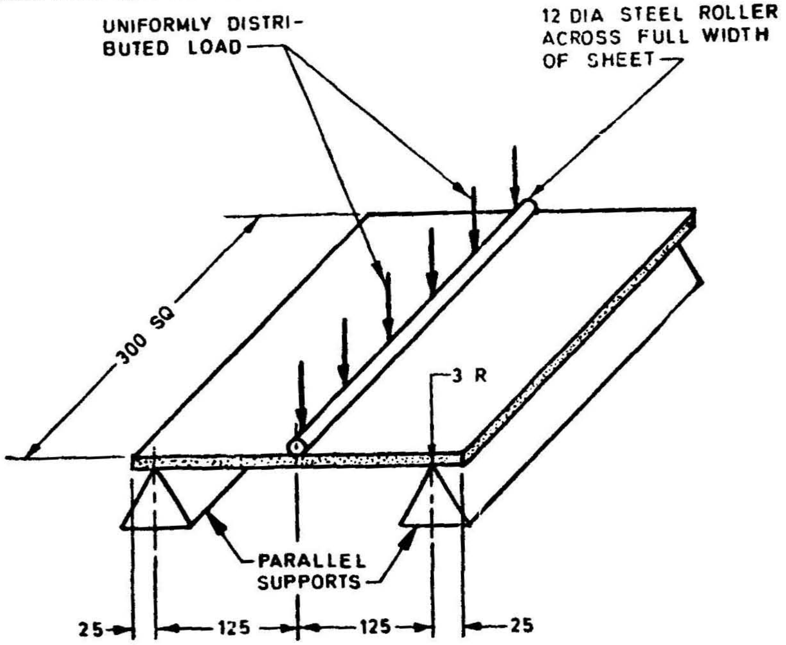
UNIFORMLY DISTRIBUTED LOAD
12 DIA STEEL ROLLER ACROSS FULL WIDTH OF SHEET
300 SQ
3 R
PARALLEL SUPPORTS
25
125
125
25

Fig. 2 Arrangement of Loading

3.2.3 *Report* — The report shall indicate for each individual test specimen, the deflection measured as per **3.2.2.2** and **3.2.2.3.**

3.3 Precast Reinforced Gypsum Slabs

3.3.1 *Test Specimen* — Not less than 5 full size short-span slabs or long span slabs shall be tested. The specimens shall be conditioned to constant mass at a temperature of 27 + 2°C, in an atmosphere having a relative humidity of 65 ± 2 percent.

3.3.2 *Testing* — The slab shall be placed symmetrically over the supports flatwise on the bearing edges and equal loads applied at points one-fourth from each support through bearing edges against the upper surface of the slab; or a uniformly distributed load shall be applied over the slab between supports. The load lines and the supports shall be parallel, and the loads shall be applied normal to the upper surface of the slab. The clear span between supports shall be 2 000 mm for long-span slabs, and 700 mm for short span slabs. The load shall be applied at a uniform rate or in increments not in excess of 100 kg/m^2, such as to result in failure of the specimen in 10 to 20 minutes. In addition, deflection of the long span slabs at midspan shall be determined to the nearest 0·025 mm for each 100 kg/m^2 increment of loading.

3.3.3 *Report* — The average load at failure of the specimens shall be reported.

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

Section 5 Compressive Strength

(First Revision)

1. SCOPE

1.1 This standard (Part II/Section 5) covers the method of determining compressive strength of gypsum partition blocks.

2. TERMINOLGY

2.1 For the purpose of this standard, the definitions given in IS : 2469-1976* shall apply.

3. PROCEDURE

3.1 Partition Blocks

3.1.1 *Test Specimens* — Full-size block specimens shall be tested. Condition the specimens at a temperature of 27 ± 2°C in an atmosphere having a relative humidity of 65 ± 2 percent. Weigh the specimens at 1-day intervals until constant mass is attained. At the option of the manufacturer or purchaser, strength tests may be conducted on specimens that are dried at room temperature. However, in cases of controversy all test specimens shall be dried to constant mass as herein prescribed.

3.1.2 *Testing*

3.1.2.1 The specimen shall be tested in the position in which the block is designed to be used, and shall be bedded on and capped with a felt pad neither less than 3 mm nor more than 6 mm in thickness. At the option of the manufacturer or purchaser or in cases of controversy, the specimens may be suitably capped with calcined gypsum mortar or the bearing surfaces of the block may be planed or rubbed smooth and true. When calcined gypsum is used for capping, the test may be conducted after the capping has set and the specimen has been dried to constant mass in accordance with **3.1.1**.

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*Glossary of terms relating to gypsum (*first revision*).

3.1.2.2 The loading head shall completely cover the bearing area of the specimen and the applied load shall be transmitted through a spherical bearing block of proper design. The speed of the moving head of the testing machine shall be not more than 1 mm per minute.

3.1.3 ***Report*** — Calculate the average compressive strength of the specimens tested and report this as the compressive strength of the block.

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

Section 6 Water Absorption

(First Revision)

1. SCOPE

1.1 This standard (Part II/Section 6) covers the method of carrying out water absorption test on gypsum plaster boards.

2. TERMINOLOGY

2.1 For the purpose of this standard the definitions given in IS : 2469-1976* shall apply.

3. PROCEDURE

3.1 Plaster Boards

3.1.1 *Test Specimens* — From each board selected from the sample, a specimen measuring 175 × 75 mm shall be cut at least 150 mm from the edge of the board. The specimen shall be weighed to within 1 g and then stored at a temperature of 27 ± 2°C in an atmosphere having a relative humidity of 65 ± 2 percent. The specimen shall be weighed once a day until the mass has become constant to within 0·1 percent.

3.1.2 *Testing*

3.1.2.1 The specimens shall be completely immersed in water at 27 ± 2°C for a period of 24 hours, with at least 30 mm height of water over the top of the specimen which shall be so positioned that it does not lie flat on the bottom of the container. These shall be taken out and weighed (W_1) after removing surplus moisture with a damp cloth. The specimens shall then be placed in an air-oven capable of being raised to 105°C and then maintained at that temperature constantly.

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*Glossary of terms relating to gypsum (*first revision*).

3.1.2.2 The specimens shall be dried until constant mass (within ± 0·1 percent of the mass of the specimens) is attained and the mass (W_2) shall be recorded for each specimen. The percentage absorption shall be calculated as follows:

$$\text{Percentage absorption} = \frac{W_1 - W_2}{W_2} \times 100$$

where

W_1 = mass of specimen after absorption, and

W_2 = mass of specimen after heating.

3.1.3 *Precautions* — The specimens shall not be placed in contact with one another, but shall be distributed uniformly throughout the oven. Wet specimens shall not be introduced into an oven in which the drying of other specimens is already in progress.

3.1.4 *Report* — The percentage water absorption of the specimen shall be reported.

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

Section 7 Moisture Content

(First Revision)

1. SCOPE

1.1 This standard (Part II/Section 7) covers the method of determining moisture content of gypsum partition blocks in the field.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2469-1976* shall apply.

3. PROCEDURE

3.1 Partition Blocks

3.1.1 *Test Specimens* — Whole blocks may be used for testing or they may be cut into halves or into true quarters. In all cases, cut specimens shall be of the full thickness of the block. Each specimen shall be marked to distinguish it from the others.

3.1.2 *Testing* — The test specimens shall be weighed immediately after cutting, and the mass (W_1) of each recorded. The specimens shall then be dried to constant mass in an air-oven capable of being raised to 105°C temperature and then maintained at that temperature constantly.

The specimens shall be weighed at intervals of 24 hours until constant mass (within ± 0·1 percent of the mass of the specimen) is attained and this mass (W_2) shall be recorded for each specimen.

---

*Glossary of terms relating to gypsum (*first revision*).

3.1.3 *Calculation* — The percentage moisture content shall be calculated from the following formula for each specimen:

$$\text{Percentage moisture content} = \frac{W_1 - W_2}{W_2} \times 100$$

where

W_1 = initial mass, and
W_2 = dry mass

3.1.4 *Report* — The average of the values of moisture content for the specimens shall then be reported as that of the whole consignment.

Indian Standard

METHODS OF TEST FOR GYPSUM PLASTER, CONCRETE AND PRODUCTS

PART II GYPSUM PRODUCTS

Section 8 Nail Retention of Precast Reinforced Gypsum Slabs

(First Revision)

1. SCOPE

1.1 This standard (Part II/Section 8) covers the method of determining nail retention of precast reinforced gypsum slabs.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 2469-1976* shall apply.

3. PROCEDURE

3.1 Precast Reinforced Gypsum Slabs

3.1.1 *Test Specimens* — Sections of full thickness and at least 150 mm square from slabs shall be tested. The specimens shall be conditioned to constant mass at a temperature of 27 ± 2°C in an atmosphere having a relative humidity of 65 ± 2 percent.

3.1.2 *Testing* — Copper roofing nails of 3 mm diameter at least 3 in number shall be driven to a depth of 25 mm. The nails shall be then pulled out axially and the force required to affect pull-out shall be measured in *N*.

NOTE — Galvanized iron nails may also be used instead of copper nails.

3.1.3 *Report* — The average force required to pull out all the nails from the specimens shall be reported as the pull-out load.

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*Glossary of terms relating to gypsum (*first revision*).

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